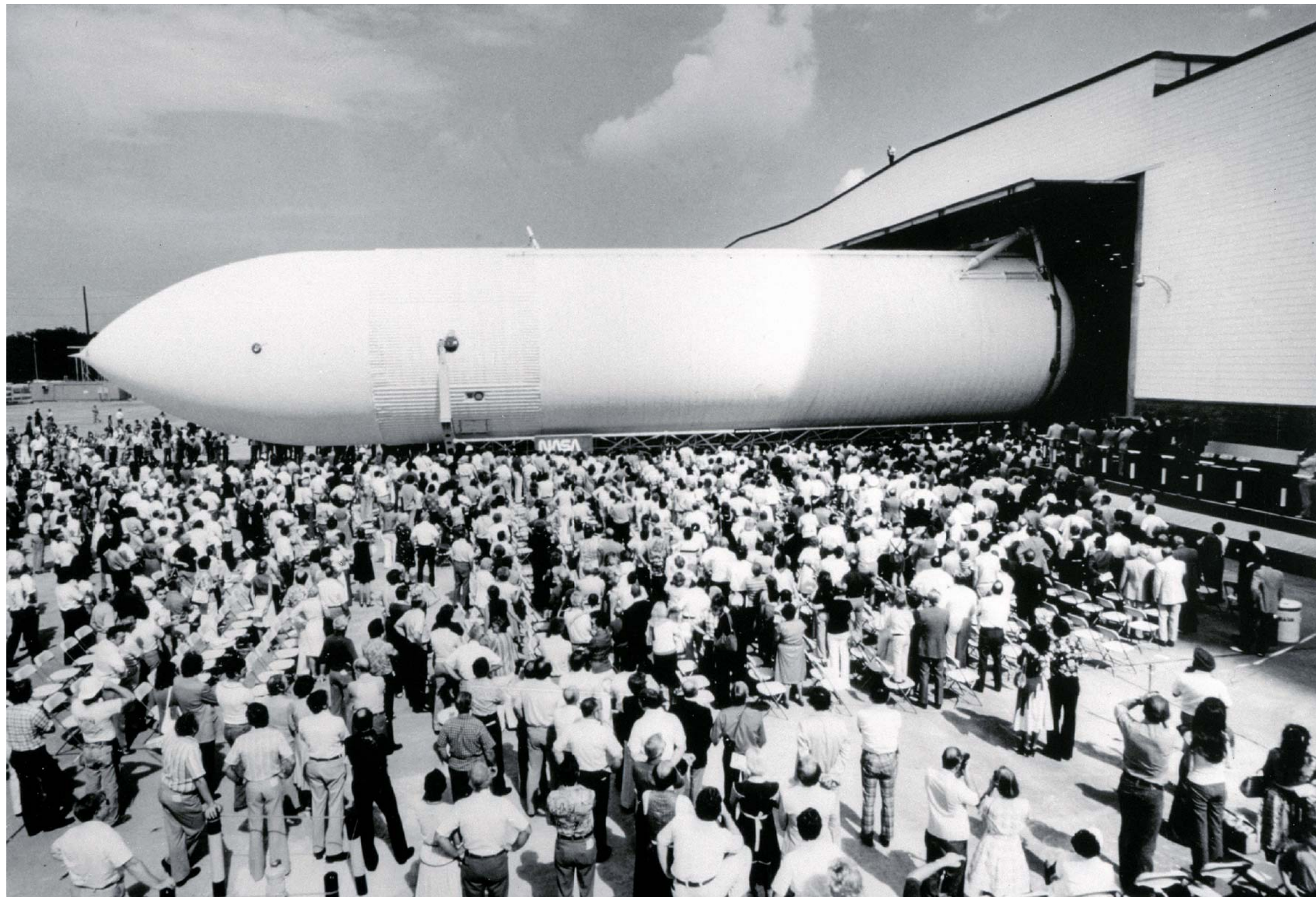
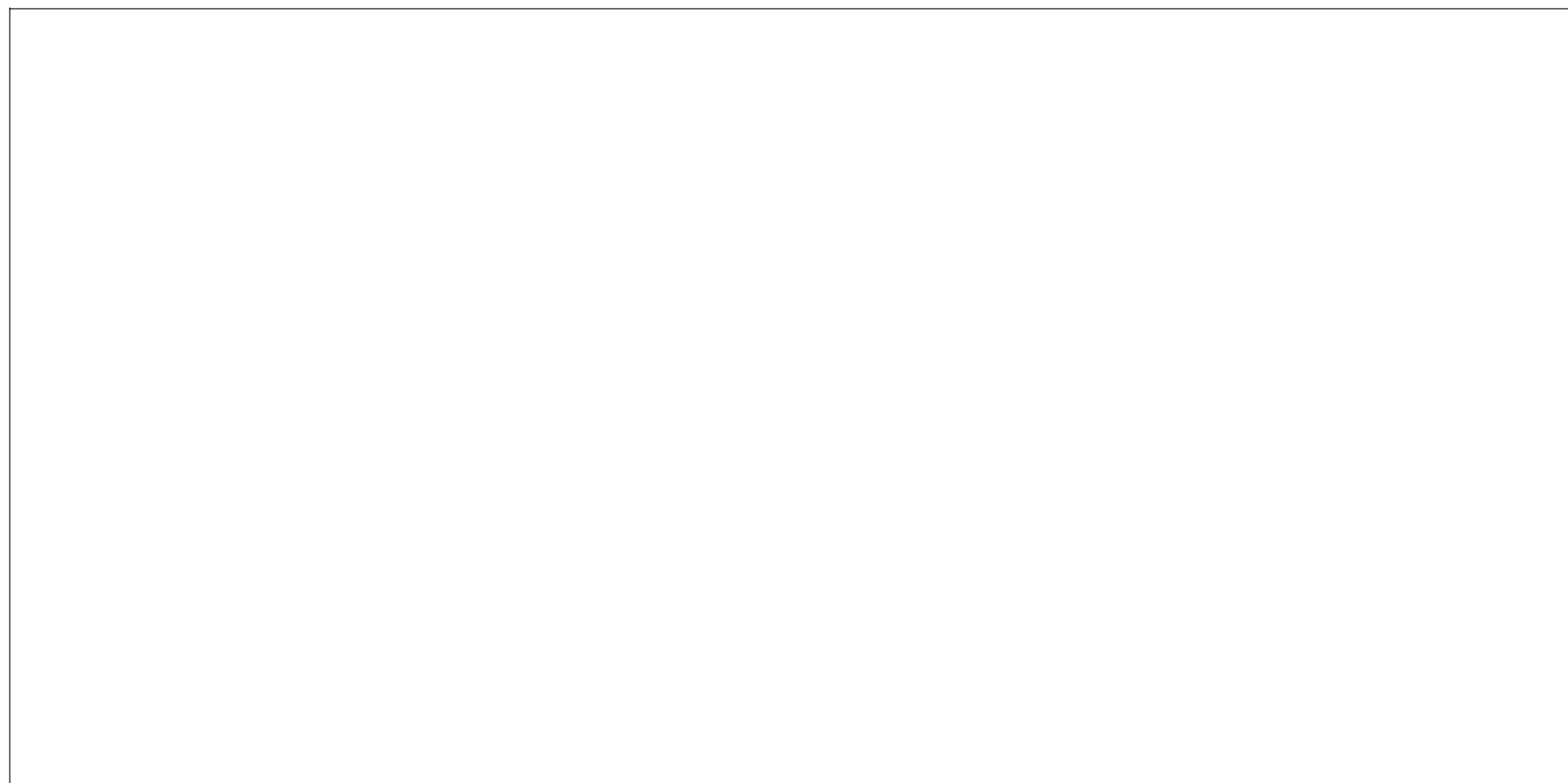


Space Transportation System External Tank



THIS TEXT IS A SAMPLE TEXT, IT WAS COPIED VERBATIM FROM "WINGS IN ORBIT" AS A PLACE HOLDER!

The ET was 46.8 m (153.6 ft) in length with a diameter of 8.4 m (27.6 ft), which made it the largest component of the shuttle. The ET contained two internal tanks—one for the storage of liquid hydrogen and the other for the storage of liquid oxygen. The hydrogen tank, which was the bigger of the two internal tanks, held 102,737 kg (226,497 pounds) of hydrogen. The oxygen tank, located at the top of the ET, held 619,160 kg (1,365,010 pounds) of oxygen. Both tanks provided the fuel to the main engines required to provide the thrust for the vehicle to achieve a safe orbit. During powered flight and ascent to orbit, the ET provided about 180,000 L/min (47,000 gal/min) of hydrogen and about 67,000 L/min (18,000 gal/min) of oxygen to all three Space Shuttle Main Engines with a 6-to-1 mixture ratio of liquid hydrogen to liquid oxygen.



VICINITY MAP NEW ORLEANS, LA

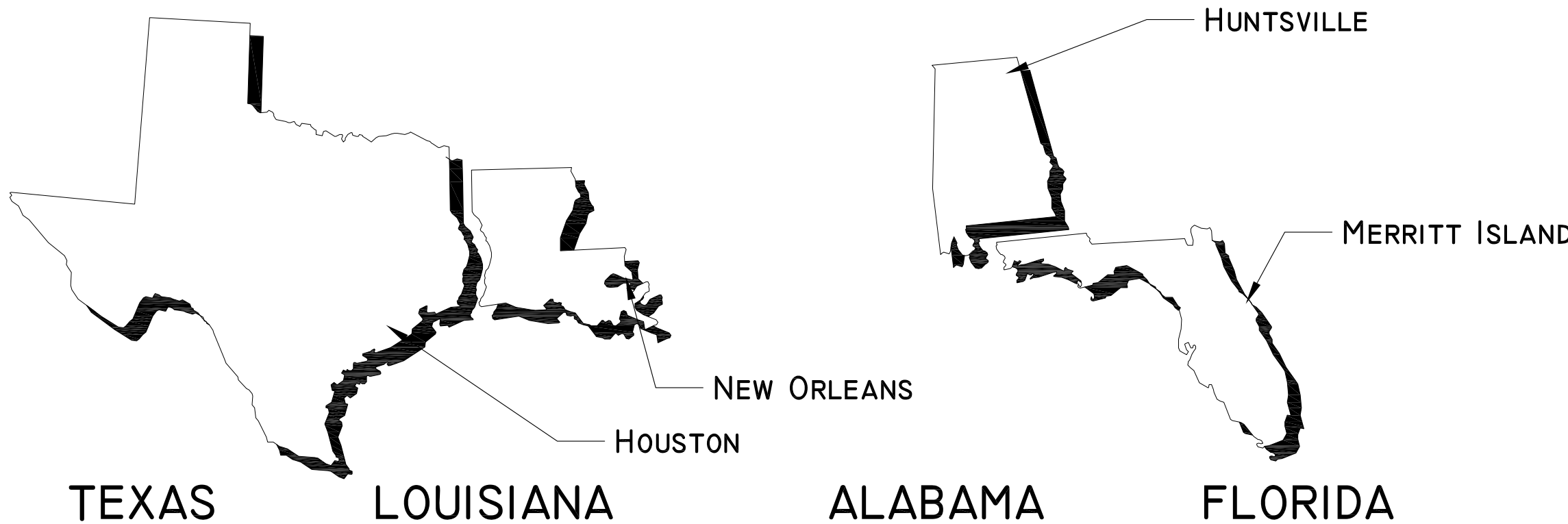
The tanks played two major roles during launch: containing and delivering cryogenic propellants to the Space Shuttle Main Engines, and serving as the structural backbone for the attachment of the Orbiter and Solid Rocket Boosters. The ET's Thermal Protection System, composed of spray-on foam and hand-applied insulation and ablator, was applied primarily to the outer surfaces of the tank. It was designed to maintain the quality of the cryogenic propellants, protect the tank structure from ascent heating, prevent the formation of ice (a potential impact debris source), and stabilize tank internal temperature during re-entry into Earth's atmosphere, thus helping to maintain tank structural integrity prior to its breakup within a predicted landing zone.

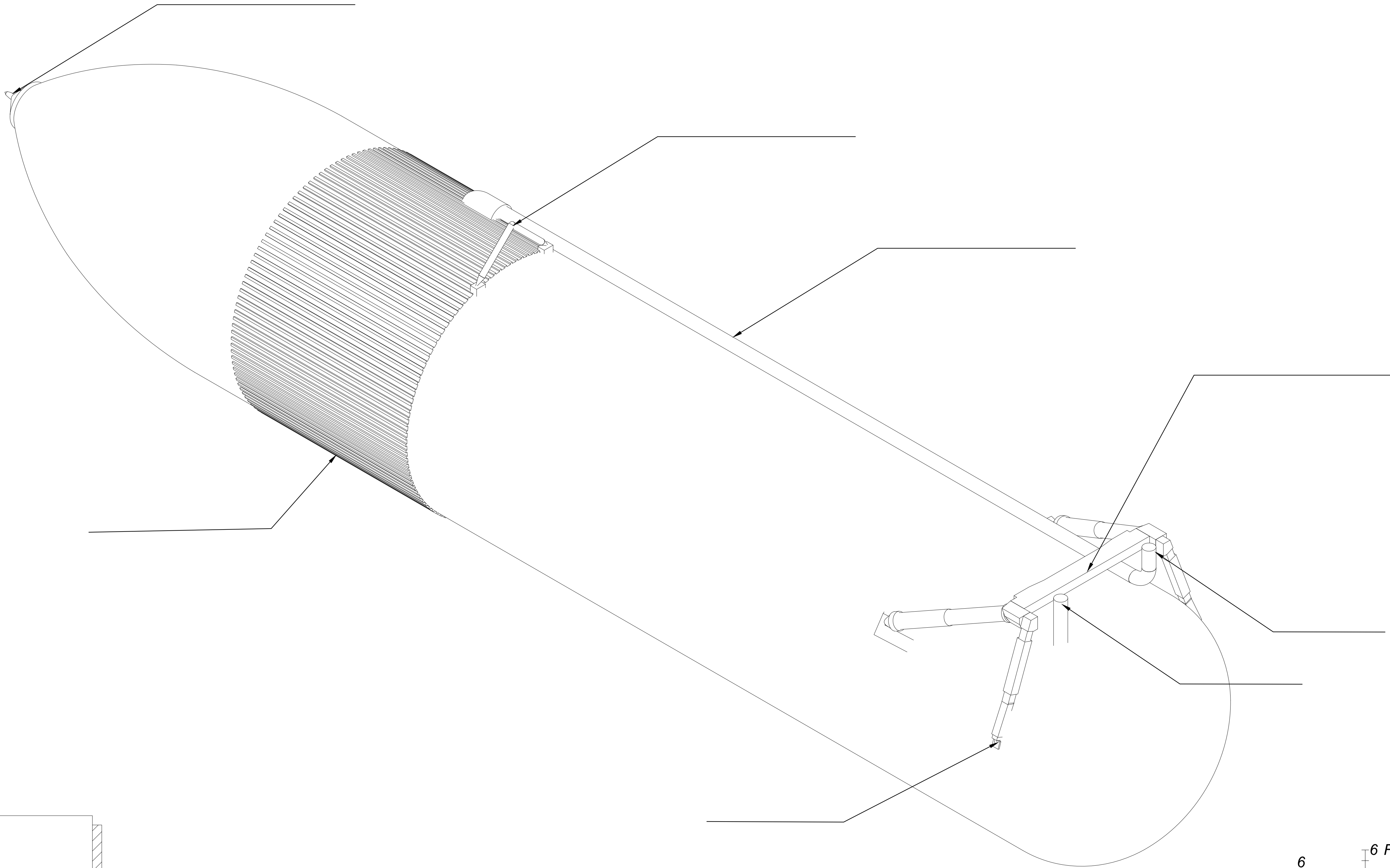
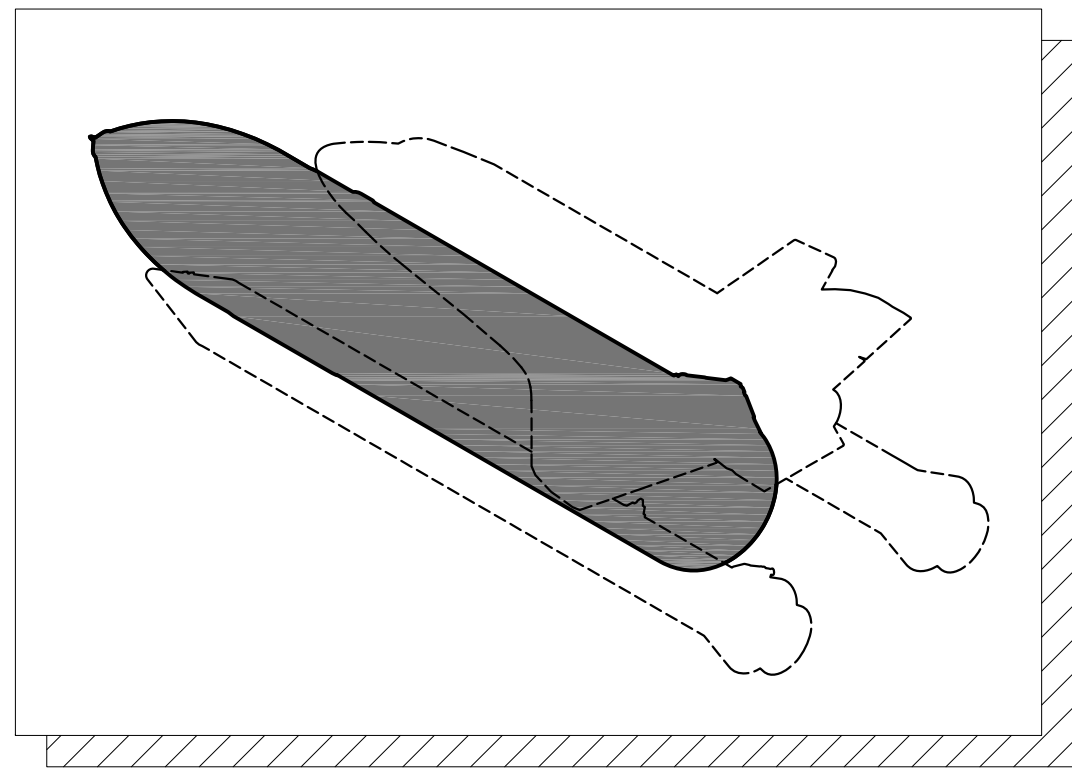
NASA applied two basic types of Thermal Protection System materials to the ET. One type was a low-density, rigid, closed-cell foam. This foam was sprayed on the majority of the tank's "acreage"—larger areas such as the liquid hydrogen and liquid oxygen tanks as well as the intertank—also referred to as the tank "sidewalls." The other major component was a composite ablator material (a heat shield material designed to burn away) made of silicone resins and cork. NASA oversaw the development of the closed-cell foam to keep propellants at optimum temperature—liquid hydrogen fuel at -253°C (-423°F) and liquid oxygen oxidizer at -182°C (-296°F)—while preventing a buildup of ice on the outside of the tank, even as the tank remained on the launch pad under the hot Florida sun.

The foam insulation had to be durable enough to endure a 180-day stay at the launch pad, withstand temperatures up to 46°C (115°F) and humidity as high as 100%, and resist sand, salt fog, rain, solar radiation, and even fungus. During launch, the foam had to tolerate temperatures as high as 649°C (1,200°F) generated by aerodynamic friction and rocket exhaust. As the tank reentered the atmosphere approximately 30 minutes after launch, the foam helped hold the tank together as temperatures and internal pressurization worked to break it up, allowing the tank to disintegrate safely over a remote ocean location. Though the foam insulation on the majority of the tank was only about 2.5 cm (1 in.) thick, it added approximately 1,700 kg (3,800 pounds) to the tank's weight. Insulation on the liquid hydrogen tank was somewhat thicker—between 3.8 and 5 cm (1.5 to 2 in.). The foam's density varied with the type, but an average density was 38.4 kg/m³ (2.4 pounds/ft³).

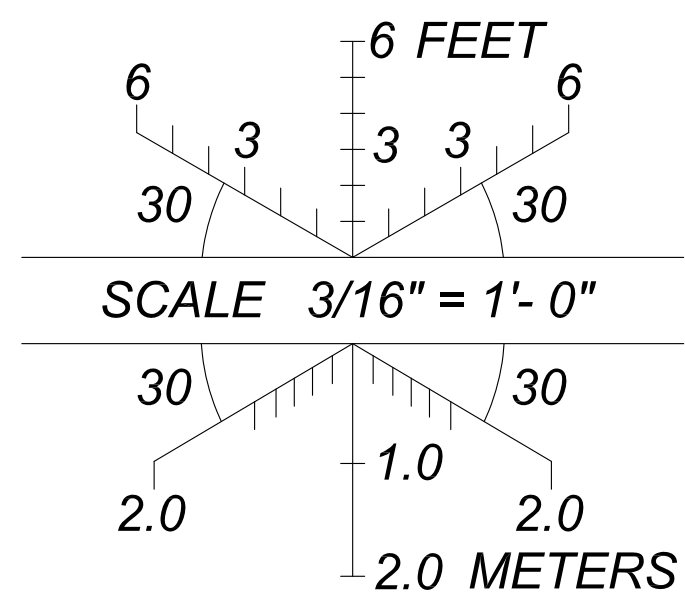


This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering, industrial, and maritime works in the United States. The HAER program is administered by the National Park Service, U.S. Department of the Interior. The Space Transportation System recording project was cosponsored during 2011 by the Space Shuttle Program Transition and Retirement Office of the Johnson Space Center (JSC), with the guidance and assistance of Barbara Severance, Integration Manager, JSC, Jennifer Groman, Federal Preservation Officer, NASA Headquarters and Ralph Allen, Historic Preservation Officer, Marshall Space Flight Center. The field work and measured drawings were prepared under the general direction of Richard O'Connor, Chief, Heritage Documentation Programs, National Park Service. The project was managed by Thomas Behrens, HAER Architect and Project Leader. The Space Transportation System Recording Project consisted architectural delineators, John Wachtel, Iowa State and Joseph Klimek, Illinois Institute of Technology. This documentation is based high-definition laser scans provided by Smart GeoMetrics, Houston, Texas and documentation provided by NASA's Headquarters, Johnson Space Center and Marshall Space Flight Center. Written historical and descriptive data was provided by Archaeological Consultants Inc., Sarasota, Florida. Large-format photographs were produced by NASA's Imaging Lab at Johnson Space Flight Center with supplemental images provided by Jet Lowe, HAER photographer.





EXTERNAL TANK



DRAFT

DELINEATED BY:

SPACE TRANSPORTATION SYSTEM
RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

HOUSTON

SPACE TRANSPORTATION SYSTEM, EXTERNAL TANK

JOHNSON SPACE CENTER, 201 NASA PARKWAY
HARRIS COUNTY

TEXAS

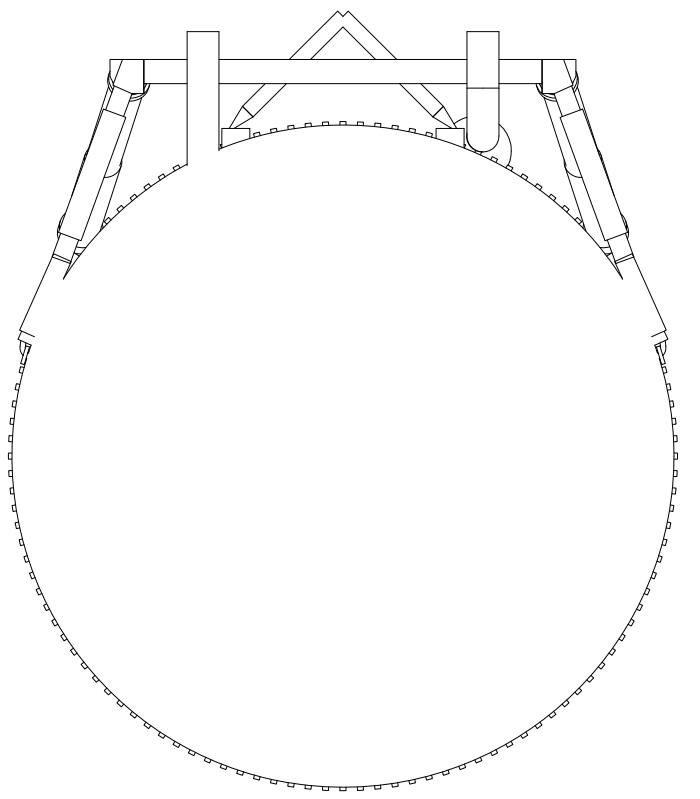
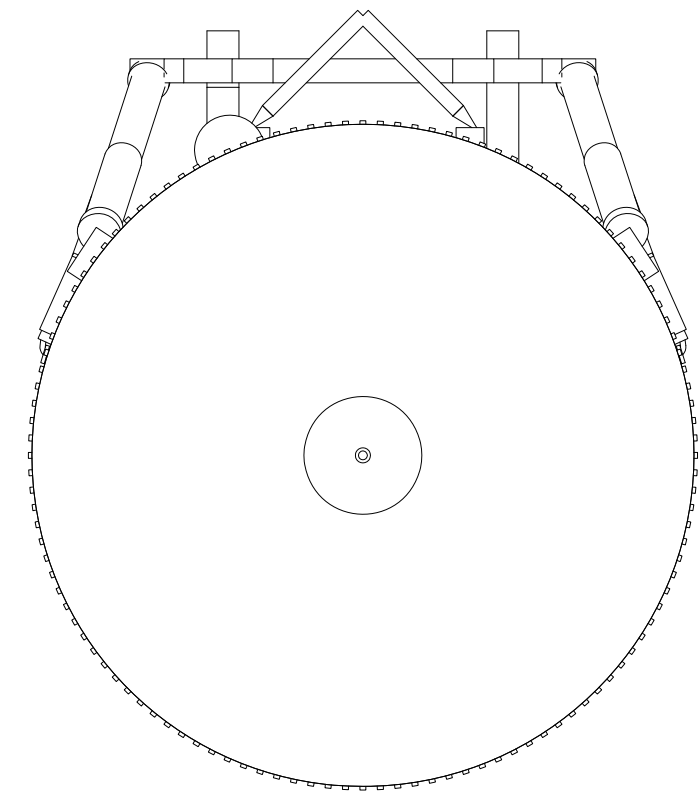
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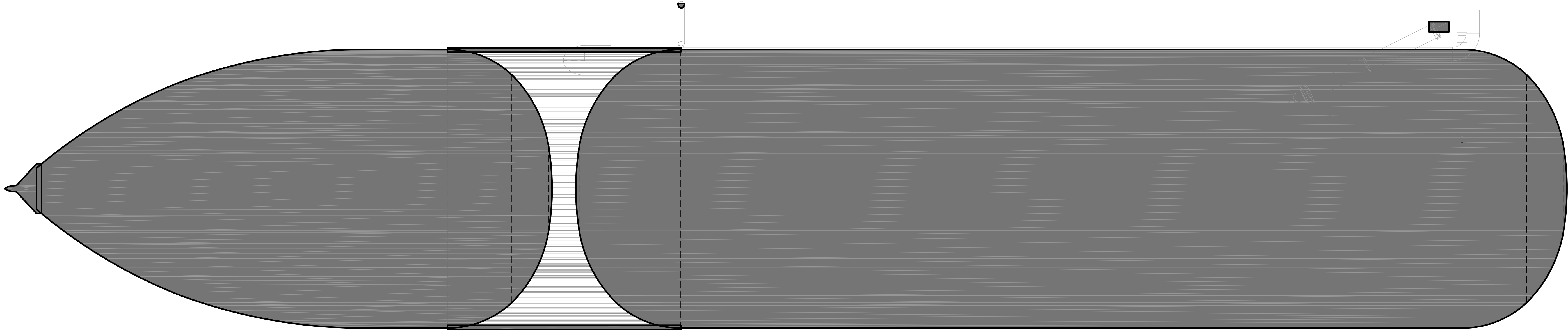
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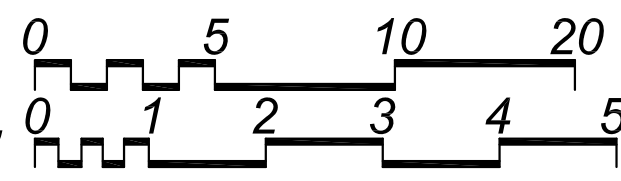
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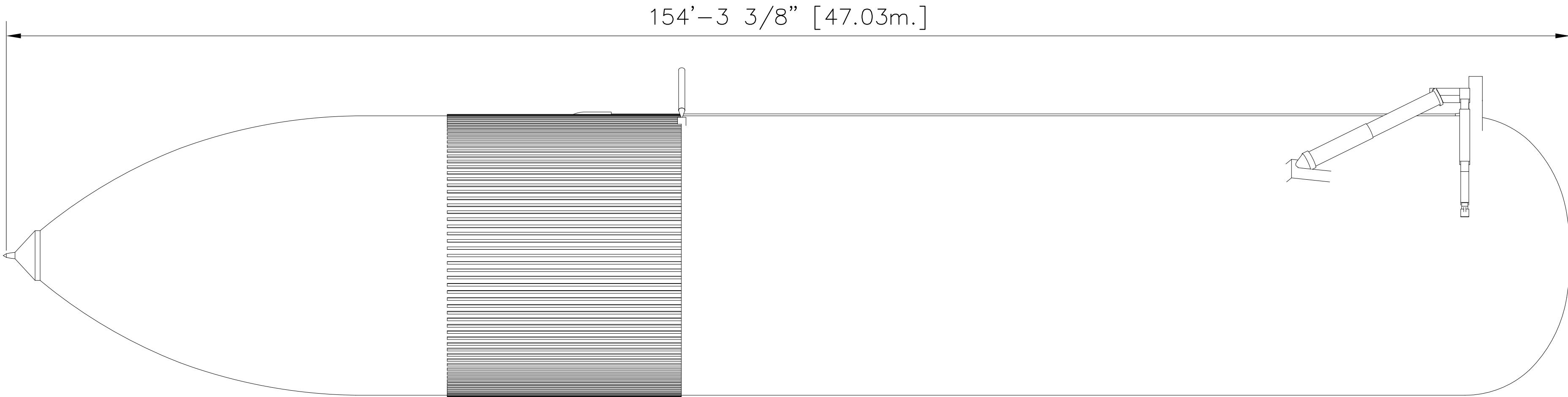


PLACEHOLDER
TEXT BOX

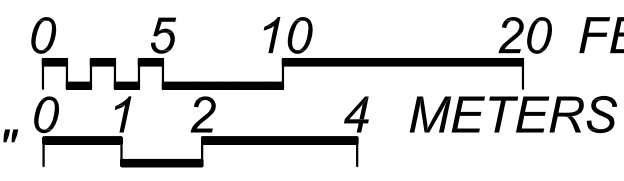


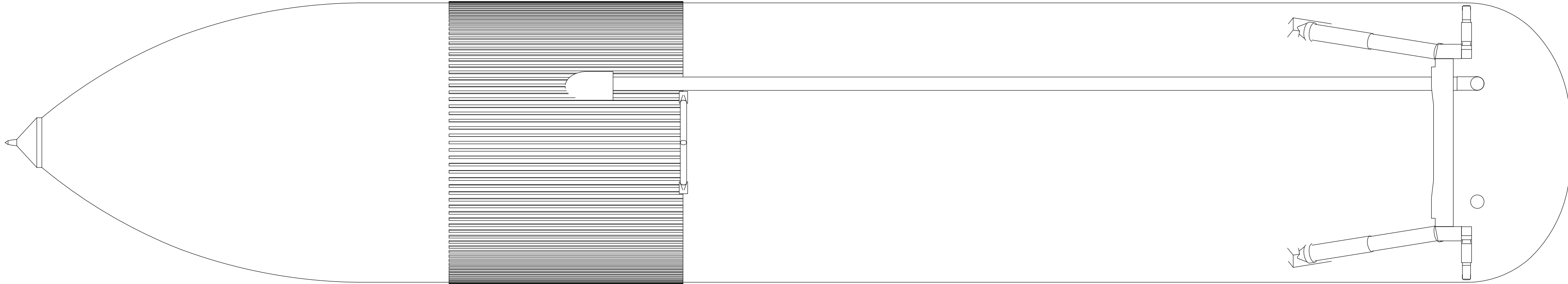
LONGITUDINAL SECTION

SCALE: 3/16" = 1'-0"  FEET
METERS



154'-3 3/8" [47.03m.]

SCALE: 1/8" = 1'-0"  FEET
METERS



EXTERNAL TANK

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SPACE TRANSPORTATION SYSTEM
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HOUSTON

SPACE TRANSPORTATION SYSTEM, EXTERNAL TANK

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